



Giant Kangaroo Rat Distribution Survey Report

Panoche Valley Solar Project

San Benito County, California

August 2013



Giant Kangaroo Rat Distribution Survey Report Panoche Valley Solar Energy Project

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Date:
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A handwritten signature in black ink, appearing to read "TE", written over a horizontal line.

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A handwritten signature in blue ink, appearing to read "JMR", written over a horizontal line.

James McRacken
Senior Biologist

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1.0 Introduction

Panoche Valley Solar, LLC (PVS), a partnership between Duke Energy Renewables (Duke) and PV2 Energy, proposes to construct and operate a solar photovoltaic energy generating facility located in San Benito County, CA that will generate approximately 399-megawatt (MW) (**Figure 1**). The project is called the Panoche Valley Solar Farm Project (Proposed Project); the solar site (project area) contains approximately 2,813 acres of heavily grazed (cattle and sheep) land in the Panoche Valley of eastern San Benito County, CA (**Figure 2**). The proposed project would also include approximately 23,292 acres of high quality Conservation Lands that are contiguous with the approximately 2,813-acre Project Area (**Figure 3**). These high quality lands are the Valley Floor Conservation Lands, Valadeao Ranch Conservation Lands, and Silver Creek Ranch Conservation Lands. The project area and conservation lands are collectively referred to as the “Study Area”.

The federally and state-endangered giant kangaroo rat (*Dipodomys ingens*; GKR) inhabits the Study Area. The GKR is a very large, brownish kangaroo rat with a light brown tail tip. Adult male GKR can weigh up to 157 grams, nearly double the weight of other coexisting kangaroo rats (Grinnell 1932), and can have a total length of approximately 31.1 centimeters (cm). Another way to distinguish the GKR from other coexisting kangaroo rat species found within the Study Area is the number of toes on the hind foot. The hind feet of adult GKR each have five toes and are longer than 4.7 cm (Best 1993).

1.1 History of GKR

Historically, GKR was known to occur over vast stretches of the western San Joaquin Valley, Carrizo Plain, and Cuyama Valley; as well as scattered colonies on steeper slopes and ridge tops in the Ciervo, Kettleman, Tumey, and Panoche Hills, and in the Panoche Valley (Grinnell 1932, Shaw 1934, Hawbecker 1944, USFWS 1998). The Panoche Region in western Fresno and eastern San Benito Counties is currently identified as one of the six major geographical units for remaining GKR populations. The remaining five major geographical units are Kettlemen Hills in Kings County, San Juan Creek Valley in San Luis Obispo County, western Kern County in the area of the Lokern, Elk Hills, and other uplands, Carrizo Plain Natural Area in eastern San Luis Obispo County, and Cuyama Valley in Santa Barbara and San Luis Obispo Counties (USFWS 1998).

1.2 Characteristics of GKR

The GKR is primarily a seed-eater, but will occasionally consume green plants and insects. Foraging takes place year round in all types of weather from around sunset to near sunrise with most activity taking place within two hours of sunset. Ripening heads of grasses and forbs are cut off and placed in small surface pits in full sun located near the GKR’s burrow system. After a period of time the seeds are moved into storage underground for consumption at a later date. The purpose of curing the seeds is assumed to prevent mold growth after the seeds are moved below ground (Shaw 1934). Full sun exposure is important to ensure that seeds are fully cured. Largeleaf filaree (*Erodium macrophyllum*) and shining peppergrass (*Lepidium nitidum*) are two important seed producing plants utilized by GKR. Peppergrass species ripen earlier in the year and may be one of the more important seed sources for

GKR (Williams et al. 1993). The ability to transport large quantities of seeds in cheek pouches, coupled with the highly developed seed curing and caching behaviors, probably allows GKR to endure prolonged droughts of one or two years without major regional population effects (Williams et al. 1993).

GKR live in burrow systems referred to as precincts, which is the most intensely used portion of its home range. Precincts consist of one to five separate burrow openings within one to eight meters of one another. A typical precinct has three burrows that are independent of one another and not interconnected (Williams and Kilburn 1991). Grinnell (1932) and Shaw (1934) found that precincts are occupied by a single animal. Precincts of individuals are arranged in colonies with other precincts, and colonies are generally separated by several hundred meters (Williams and Kilburn 1991). These GKR precincts are easily spotted in spring due to the denser, lush vegetation compared to the intervening areas. Plants on a precinct are the first to turn green after autumn rains and the last to ripen and turn brown in the spring (Grinnell 1932, USFWS 1998). Population density of GKR can be estimated by counting precincts within a colony. Grinnell (1932) found that colonies contained between 18 and 69 precincts, with a mean of 52 individuals per hectare.

Female GKR have displayed an adaptable reproductive pattern that reflects surrounding population densities and food availability. During times of high density, females have a short reproductive season during the winter (December to April). However, in times of low population densities, females may continue to breed well into the summer (December to September; USFWS 1998). This ability to extend the breeding season can possibly lead to population irruptions during favorable climatic conditions. Populations in the northern reaches of the GKR range went from an estimated 2,000 individuals in 1980 – 1985, to an estimated 37,125 individuals in 1992 – 1993, following the end of a prolonged drought (Williams et al. 1995). During the post-drought January – May breeding season, approximately 44% of counted litters contained two young, however, one female had a litter of three and the remaining 39% had a litter of one.

Young GKR begin to disperse at approximately 11 – 12 weeks after birth. However, young may remain in their natal precinct in times of high population densities. The young may remain until the opportunity to disperse arises or they are driven off by their mother. Young often disperse into existing burrows of other adults that have died or moved to another location.

GKR often fall prey to numerous predators, including Great Horned Owl (*Bubo virginianus*), Western Burrowing Owl (*Athene cunicularia hypugaea*), short-eared owl (*Asio flammeus*), coyote (*Canis latrans*), San Joaquin Kit Fox (*Vulpes macrotis mutica*), and American badger (*Taxidea taxus*). Snakes that might prey on GKR include coachwhip (*Coluber flagellum*), gopher snake (*Pituophis catenifer*), king snake (*Lampropeltis* spp.), and western rattlesnake (*Crotalus* spp.). When abundant, GKR out-compete other rodents within the colony and are the only rodent present (Grinnell 1932).

Presently, the GKR population is divided into two main population sections. The northern population section is comprised of sub-populations in the Panoche Region, which include the Tumey Hills, Ciervo Hills, Monocline Ridge, Panoche Hills, and Panoche Valley sub-populations (Loew et al. 2005, USFWS 1998). Connectivity and genetic flow between these sup-populations is key to maintaining genetic

diversity in GKR throughout the northern populations. Loew et al. (2005) used microsatellite DNA loci to analyze the amount of gene flow taking place between the northern sub-populations using samples from the various Tumey Hills, Ciervo Hills, Monocline Ridge, and Panoche Valley colonies. Results of these analyses suggested current or relatively recent connectivity between sub-populations in the northern population section (Loew et al. 2005). Results suggested that colonies in the Tumey Hills and Monocline Ridge sub-populations had recent connectivity, most likely via a corridor along Panoche Creek after its confluence with Silver Creek. Results also suggested that colonies in the Ciervo Ridge and Tumey Hills populations had been connected with the Panoche Valley population via long distance migrants or the use of smaller stepping-stone populations (Loew et al. 2005). Panoche Valley appears to be at the northwestern extent of the GKR subpopulations (USFWS 1998).

1.3 Site Survey Background

Reconnaissance surveys conducted by Live Oak Associates (LOA) in April 2009 found evidence of GKR precincts and scat throughout the Study Area. Multiple focused biological surveys performed in the LOA Action Area between 2009 and 2012 (total of over 20,000 survey hours) then documented the presence of GKR in multiple locations. These surveys included protocol-level rare plant surveys, abridged 2009 protocol-level blunt-nosed leopard lizard (*Gambelia sika*; BNLL) surveys, distance sampling, occupancy sampling, and surveys specific to GKR for the purpose of documenting precinct locations.

Based on feedback and concerns expressed by the California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (USFWS), a 100 percent coverage survey of the project area for GKR was conducted and a systematic stratified sampling effort was completed on the on the Conservation Lands in February and March 2013. The survey methodology that was implemented was approved by CDFW.

2.0 GKR Survey Methods

Field surveys used a grid sampling system whereby 30m x 30m grid squares were evaluated for the presence of GKR sign. Grid squares were arranged along north-south running parallel transects. Surveyors visually inspected each grid square for evidence of GKR precincts. Burrow precincts were considered occupied based on presence of scat, tracks, tail-drag, pit caches, fresh excavations, and cropped vegetation around a series of suitably sized horizontal and vertical burrow openings.

Precincts that did not appear to be occupied were also identified and mapped as inactive. Precincts were considered unoccupied when characteristic horizontal and vertical burrow openings and the surrounding area are devoid of all sign (fresh scat, tracks, fresh digging, and cropped vegetation). Evidence of other congeneric species was also noted and recorded as “other kangaroo rat”.

Within the project area, the surveyed grid accounted for 100 percent coverage plus a 500 foot buffer (in areas where landowner access was granted). The Valley Floor Conservation Lands (VFCL) are interlaced within the Project Area. For this reason, the VFCL was surveyed using the same grid system as the Project Area and was subject to 100 percent coverage. The data were post-stratified following collection in the field and the results are treated separately in this report. The Silver Creek Ranch Conservation Lands (SCRCL) and Valadeao Ranch Conservation Lands (VRCL) were surveyed using the same methodology described above but with wider transects. No buffers were surveyed for the conservation lands since surveyors did not have landowner access outside these areas. Transects were systematically distributed across the project area and included areas previously identified as high and low suitability habitats in past studies. The SCRCL and VRCL surveys were designed to cover approximately 20-30 percent of the Conservation Lands, therefore, transect spacing was approximately 148 meters.

Other species of interest were also targeted during surveys and individuals and/or sign were recorded with handheld GPS when observed:

1. San Joaquin Kit Fox (SJKF) dens (known dens are those dens that are 4.5 inches in diameter or greater with SJKF sign; natal dens were areas where multiple burrow entrances were clustered in a single area with a large amount of sign);
2. Blunt nosed leopard lizards (BNLL) and habitat;
3. San Joaquin antelope squirrel (*Ammospermophilus nelsoni*; SJAS) and habitat;
4. American Badger and badger dens (distinct half moon shape – much wider than tall, other sign);
5. Western Burrowing Owl (BUOW) and BUOW burrows (burrow with white wash or pellets, BUOW feathers);
6. Raptors – eagles, hawks, falcons, owls;
7. Loggerhead Shrikes (*Lanius ludovicianus*);
8. Mountain Plovers (*Charadrius montanus*); and
9. Local carnivores: coyotes, bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), red fox (*Vulpes vulpes*).

3.0 Results

The majority of the surveys were conducted from February 20 to March 4, 2013. Weather conditions were conducive for the survey. Temperatures ranged between 27-78 degrees Fahrenheit (°F); the area experienced a large precipitation event on February 19th, but no precipitation fell during the remainder of the survey. Surveys were conducted during July 13 to 15, 2013 to reverify inactive sites.

A total of 39,009 survey grid cells were evaluated for GKR presence; 9,437 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, presence of bulls or other reasons precluding surveyors from entering the grid cell, or data equipment error. These areas are combined within the cells that are highlighted as “No Data”. Results are presented according to the various project/conservation land components in the section below.

3.1 Giant Kangaroo Rat Results Project Area

Of the 18,809 total survey grid cells located within the project area and the 500-foot buffer study area, approximately 15,749 survey grid cells were able to be evaluated within the project area (13,398 within the project area boundaries and 2,351 within the 500-foot buffer). A total of 504 of these grid cells were observed to be active at the time of the survey (3.0% of evaluated cells). A total of 387 cells were within the project boundaries and considered active (2.9% of evaluated cells in the project boundary), while 117 cells within the 500-foot buffer were considered to be active (5.0% of evaluated cells in 500 foot buffer). The remaining 3,060 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, presence of bulls or other reasons precluding surveyors from entering the grid cell, or equipment data errors. These areas are combined within the cells that are noted as “No Data”. **Table 1** describes the results of the GKR survey and **Figure 4** depicts the results of the GKR survey on the project area.

Table 1 – GKR survey results within the project area.

	GKR Grid Cell Status					TOTAL
	Active	Inactive	No GKR	Relict GKR	No Data	
Project Area	387	104	12,913	1	0	13,405
500-foot Buffer	117	222	2,012	0	3,053	5,404
TOTAL	504	326	14,925	1	3,053	18,809

3.2 Giant Kangaroo Rat Results Valley Floor Conservation Lands

Of the 9,162 total survey grid cells located within the VFCL study area, approximately 8,076 survey grid cells were evaluated. A total of 688 of these grid cells were observed to be active at the time of the survey (9.0% of the cells evaluated). The 1,086 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, presence of bulls or other reasons precluding surveyors from entering the grid cell. **Table 2** describes the results of the GKR survey and **Figure 5** depicts the results of the GKR survey on the VFCL within the study area.

Table 2 – GKR survey results within the VFCL.

	GKR Grid Cell Status					
	Active	Inactive	No GKR	Relict GKR	No Data	TOTAL
VFCL	688	686	6,701	1	1,086	9,162

3.3 Giant Kangaroo Rat Results Silver Creek Ranch Conservation Lands

Of the 10,309 total survey grid cells located within the SCRCL study area, approximately 8,211 survey grid cells were evaluated. A total of 1,883 of these grid cells were observed to be active at the time of the survey (23.0% of the cells evaluated). The 2,098 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, presence of bulls or other reasons precluding surveyors from entering the grid cell. **Table 3** describes the results of the GKR survey and **Figure 6** depicts the results of the GKR survey on the SCRCL within the study area.

Table 3 – GKR survey results within the SCRCL.

	GKR Grid Cell Status					
	Active	Inactive	No GKR	Relict GKR	No Data	TOTAL
SCRCL	1,883	1,414	4,914	0	2,098	10,309

3.4 Giant Kangaroo Rat Results Valadeao Ranch Conservation Lands

Of the 10,166 total survey grid cells located within the VRCL study area, approximately 6,973 survey grid cells were evaluated. A total of 58 of these grid cells were observed to be active at the time of the survey (1.0% of the cells evaluated). The 3,193 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, presence of bulls or other reasons precluding surveyors from entering the grid cell. **Table 4** presents the results of the GKR survey and **Figure 7** depicts the results of the GKR survey on the VRCL within the study area.

Table 4 – GKR survey results within the VRCL.

	GKR Grid Cell Status					
	Active	Inactive	No GKR	Relict GKR	No Data	TOTAL
VRCL	58	48	6,866	1	3,193	10,166

3.5 Other Results

3.5.1 San Joaquin Kit Fox

As of March 4, 2013, a total of 46 SJKF dens were observed within the study area (37 known adult dens and 8 natal dens). **Table 5** presents the results by study area component and **Figure 8** shows the locations of these dens within the study area.

Table 5 – San Joaquin Kit Fox observations

	Project Area	VFCL	SCRCL	VRCL	Total
Known Dens	2	17	7	11	37
Known Natal Dens	1	5	1	1	8
TOTAL	3	22	8	12	46

3.5.2 Western Burrowing Owl

As of March 4, 2013, a total of 33 Western Burrowing Owl Burrows were observed within the study area (10 suspected active, 4 suspected inactive, and 19 whose status was unknown). Surveys were conducted at a time of year when the full breeding population may not be present, thus the number of suspected active burrows may be higher than was observed. **Table 6** presents the results by study area component and **Figure 9** shows the locations of these dens within the study area.

Table 6 – Western burrowing owl observations

	Project Area	VFCL	SCRCL	VRCL	Total
Suspected Active	5	2	0	3	10
Suspected Inactive	1	0	0	3	4
Status Unknown	6	4	0	9	19
TOTAL	12	6	0	15	33

3.5.3 San Joaquin Antelope Squirrel

As of March 4, 2013, a total of 16 SJAS were observed within the study area. Detection rates for this species are highly temperature dependent and surveys were not necessarily conducted during times when temperatures were conducive for detection of this species. Therefore, these results do not represent an accurate estimate of SJAS distribution across the site. **Table 7** presents the results by study area component and **Figure 10** shows the locations of these dens within the study area.

Table 7 – San Joaquin antelope squirrel observations

	Project Area	VFCL	SCRCL	VRCL	TOTAL
San Joaquin Antelope Squirrels	1	0	14	1	16

3.5.4 Other Observations

As of March 4, 2013, other incidental observations included mountain plovers, golden eagles, coast horned lizard, badger burrows, and stick nests. All stick nests were inactive at the time of the survey. **Table 8** presents the results by study area component. **Figure 11** shows the locations of these dens within the study area.

Table 8 – Other incidental observations

	Project Area	VFCL	SCRCL	VRCL	TOTAL
Mountain Plover	0	2	0	0	2
Golden Eagle	0	0	0	3	3
Stick Nest	3	0	0	2	5
Badger Burrow	0	1	0	0	1
Coast Horned Lizard	0	0	00	2	2

4.0 Discussion

GKR distribution generally matched the results of past studies in the region with the highest densities occurring on SCRCL followed by the VFCL, Project area, and VRCL. The low GKR densities observed on the VRCL in many areas was likely due to the steeper topography. In the Little Panoche Valley area, near the northern extent of the VRCL, habitats appeared to be suitable for GKR occupancy, yet there were very few observations. Potential candidate relocations sites could include areas where past GKR occupancy was observed but was not active during surveys.

GKR occupancy within the project area was relatively low, with most of the high occupancy areas matching the Williams (1992) core area polygons that are excluded from the project development area and are part of the VFCL.

A breeding season Burrowing Owl survey is in the process of being completed in order to assess the activity status of the Burrowing Owl burrows observed and assist in the preparation of a Burrowing Owl Mitigation and Monitoring Plan. It is anticipated that the ongoing BNLL surveys will satisfy this survey requirement.

The other incidental observations do not require additional study to clarify results.

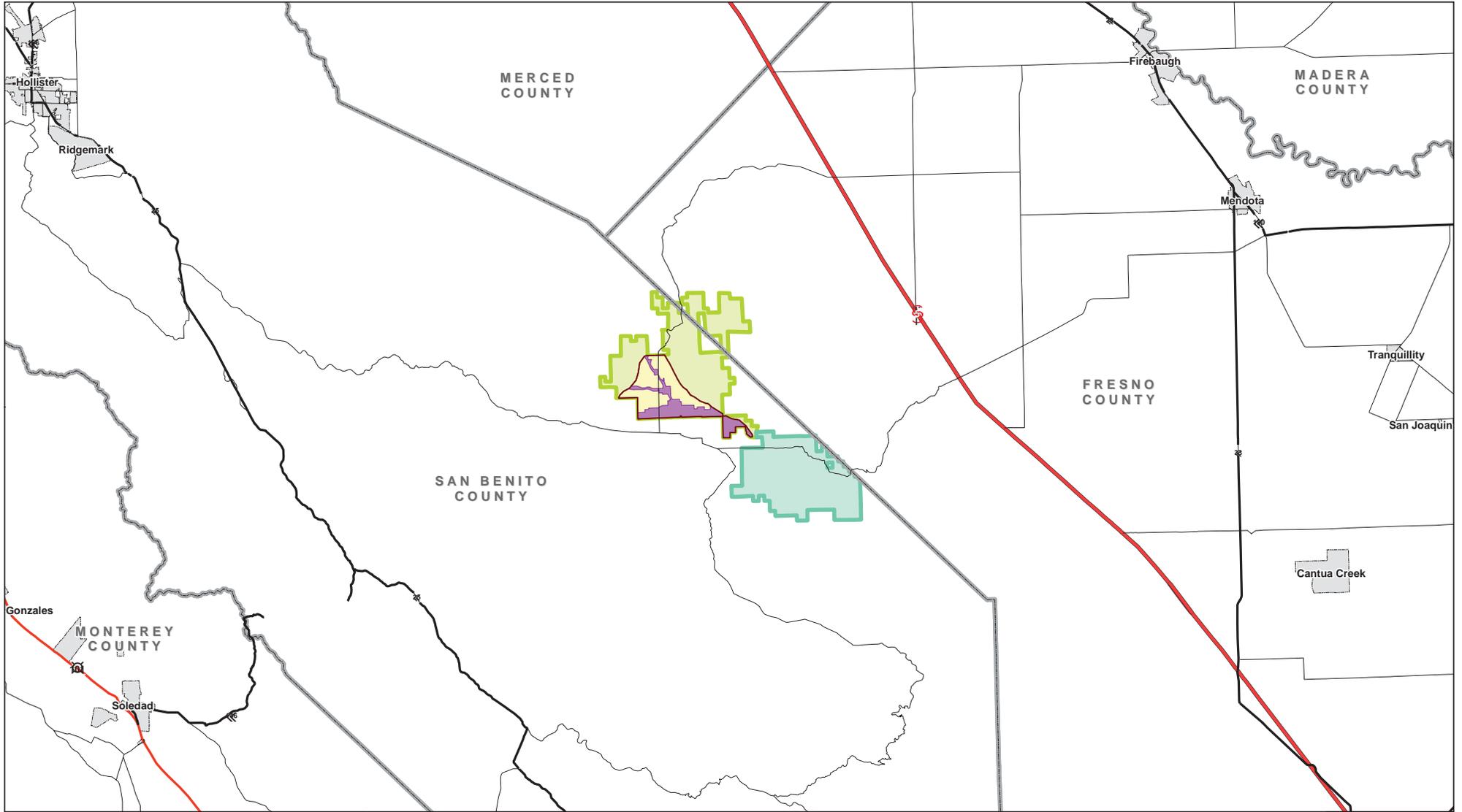
5.0 References

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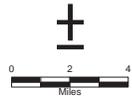
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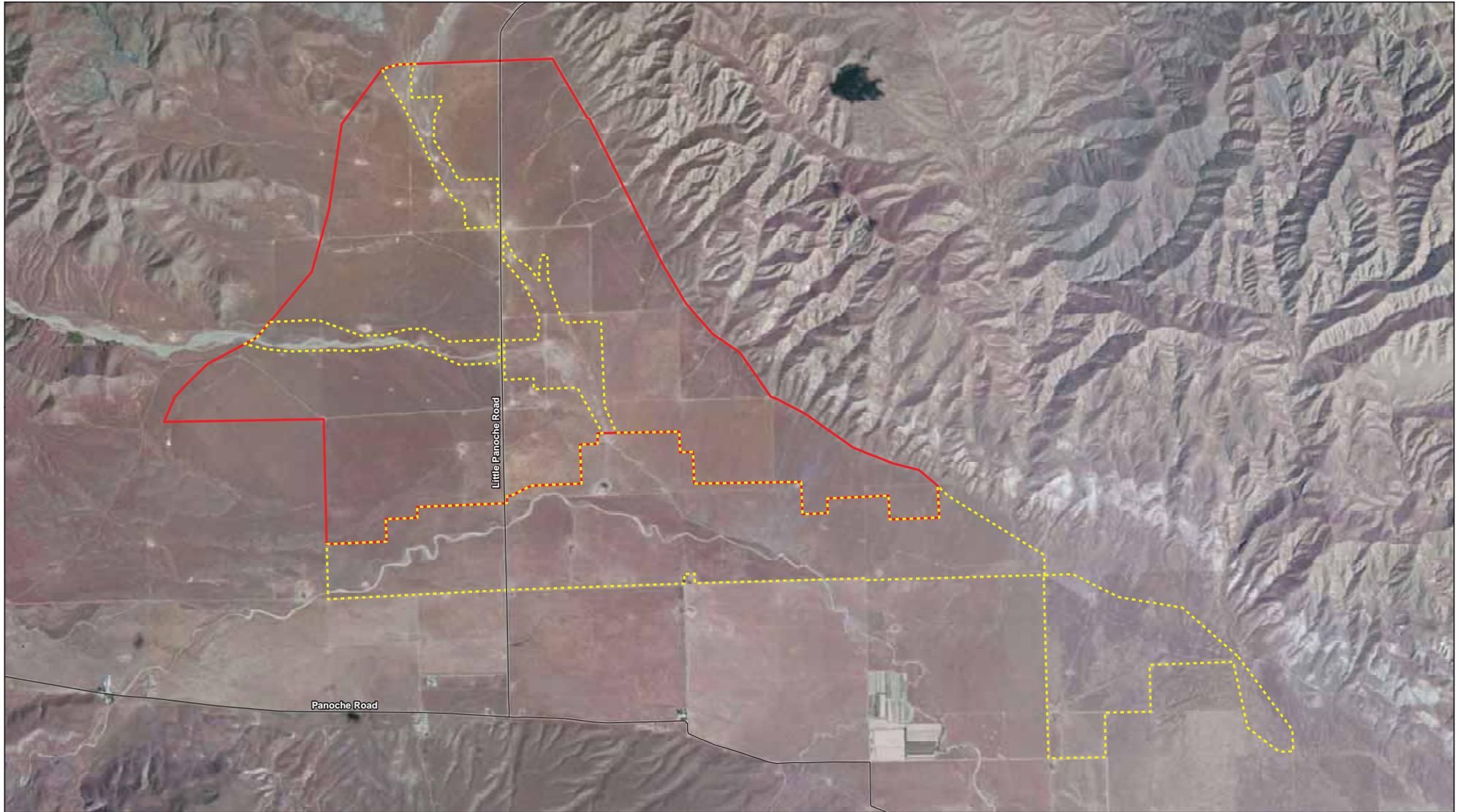
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-  Valadeao Ranch Conservation Lands
-  City Limit
-  Valley Floor Conservation Lands
-  Silver Creek Ranch Conservation Lands



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Panoche Valley Solar Project**

Site Location

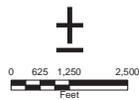
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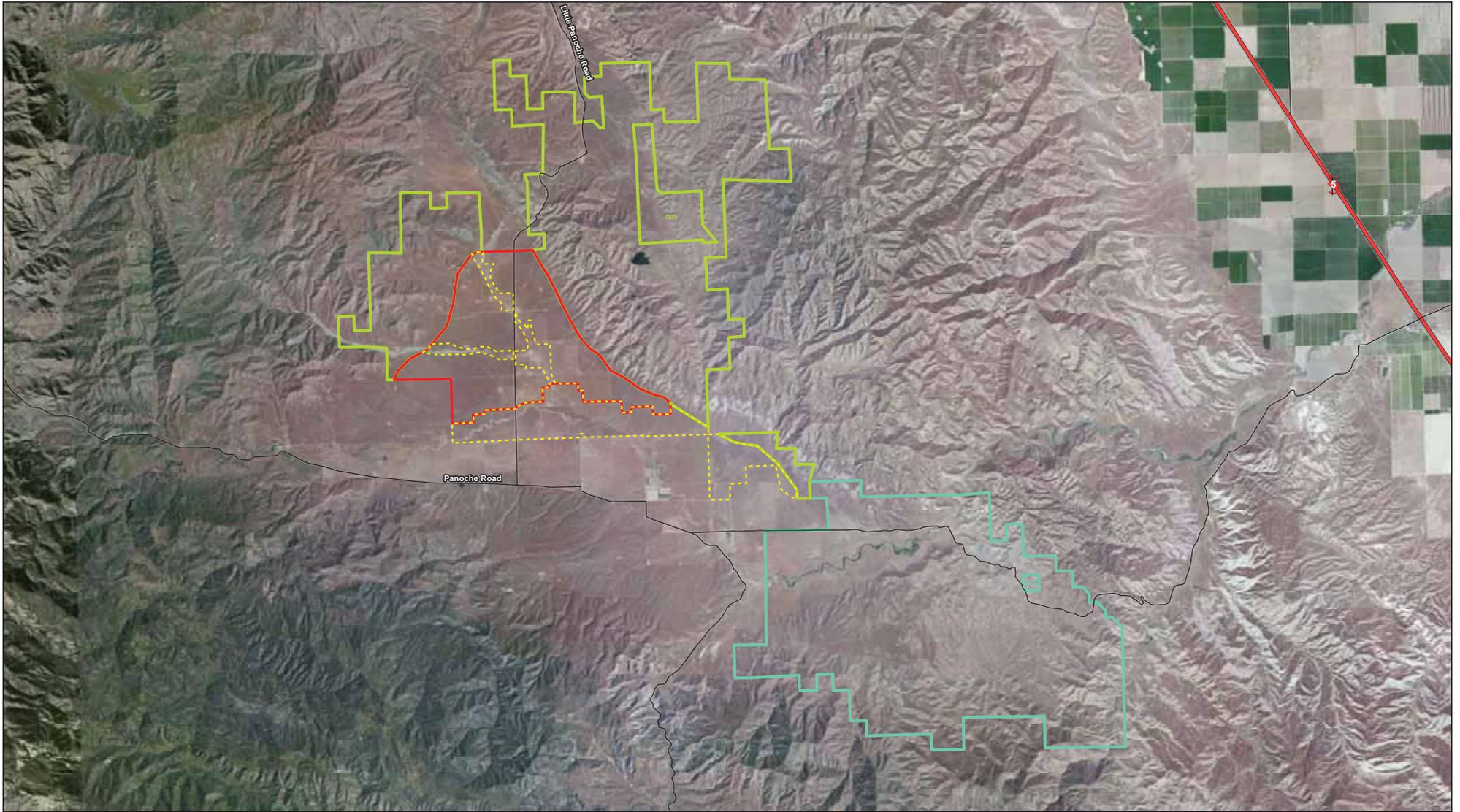
- Approximate Project Boundary
- Valley Floor Conservation Lands



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Project Area

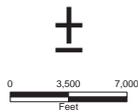
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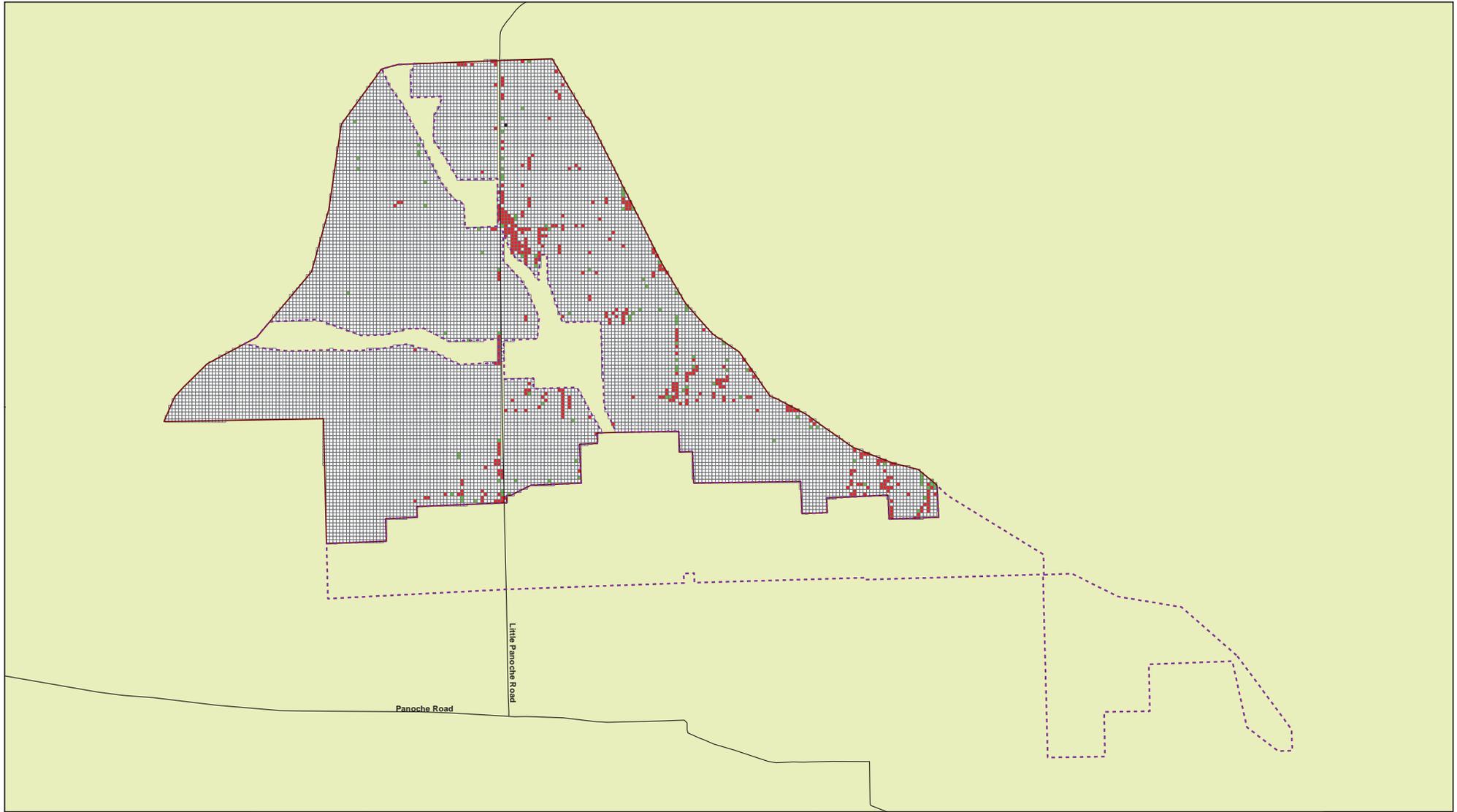
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- Valley Floor Conservation Lands
- Approximate Valadeao Ranch Boundary
- Approximate Silver Creek Ranch Boundary



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Panoche Valley Solar Project
Project Area and Conservation Lands

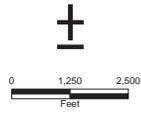
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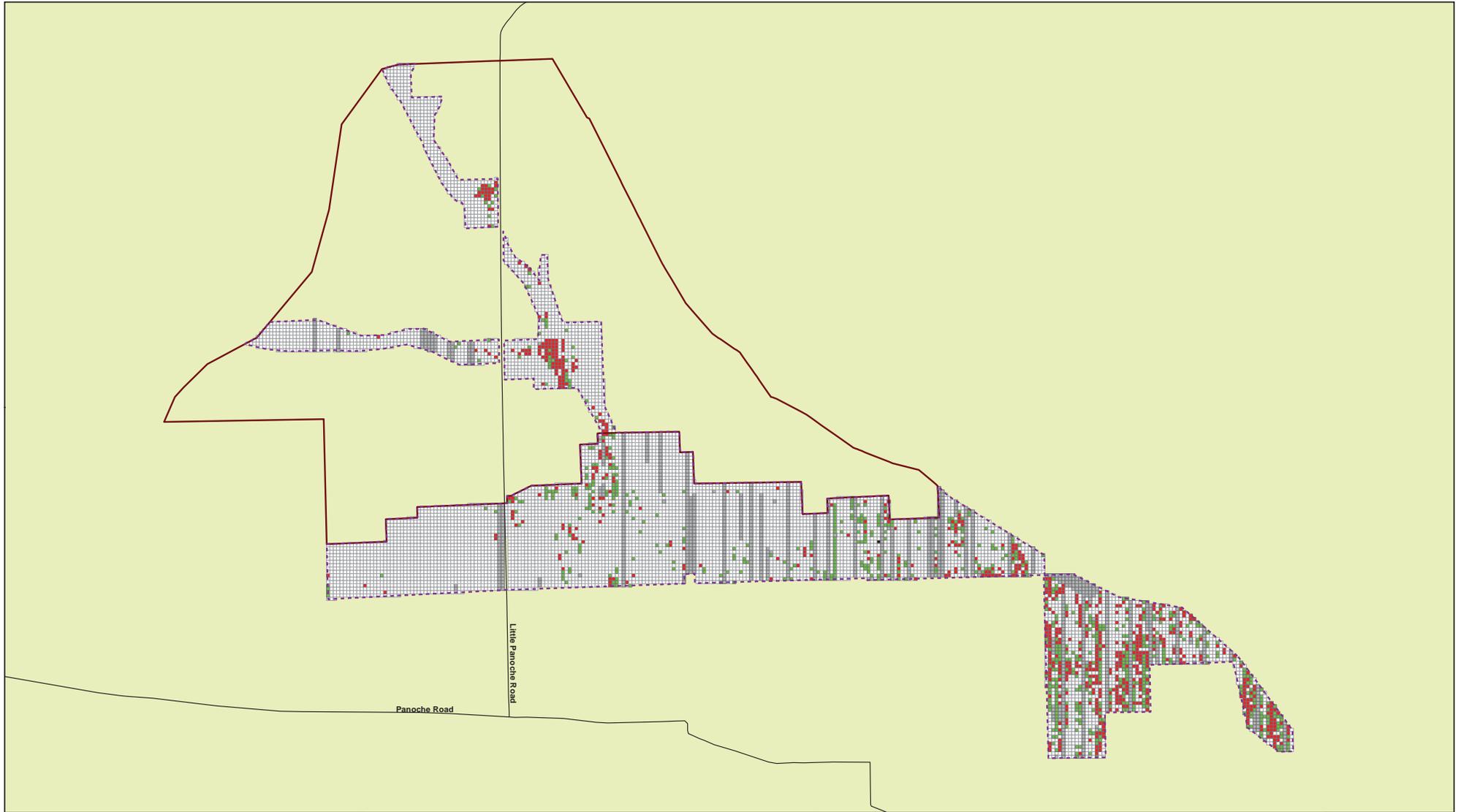
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- Approximate Project Boundary
- Valley Floor Conservation Lands
- No Activity
- GKR Evidence, Active
- GKR Evidence, Inactive
- Relict GKR Sign Present



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Panoche Valley Solar Project
GKR Survey Data and Project Area

Figure
4

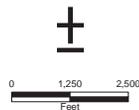


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Legend

-  Approximate Project Boundary
-  Valley Floor Conservation Lands

-  No Data
-  No Activity
-  GKR Evidence, Active
-  GKR Evidence, Inactive
-  Relict GKR Sign Present



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Panoche Valley Solar Project
GKR Survey Data and
Valley Floor Conservation Lands

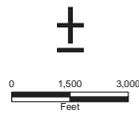
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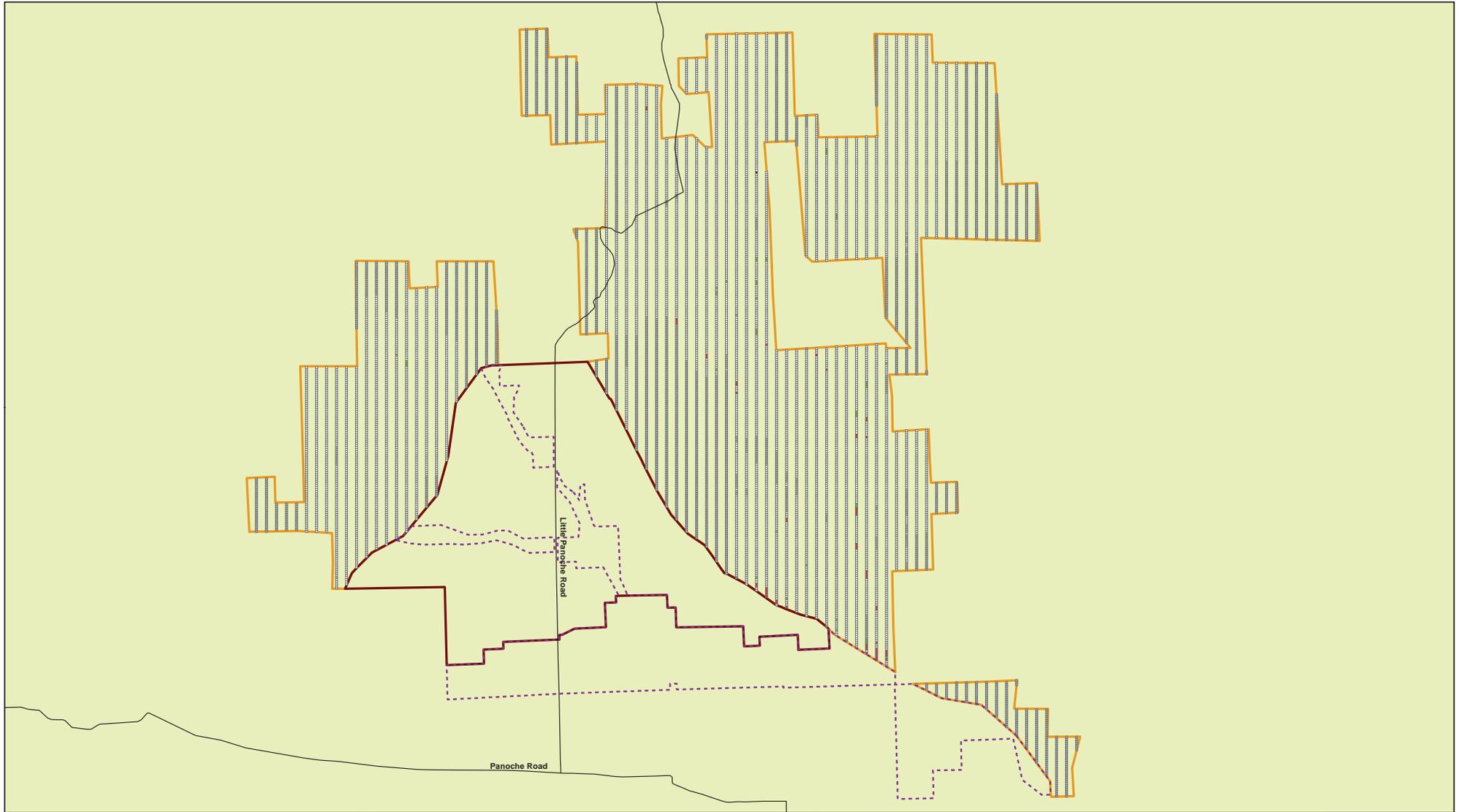
- Approximate Silver Creek Ranch Boundary
- Approximate Valadeao Ranch Boundary
- Valley Floor Conservation Lands
- No Data
- No Activity
- GKR Evidence, Active
- GKR Evidence, Inactive



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Panoche Valley Solar Project

GKR Survey Data and Silver Creek Ranch

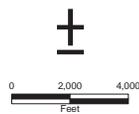
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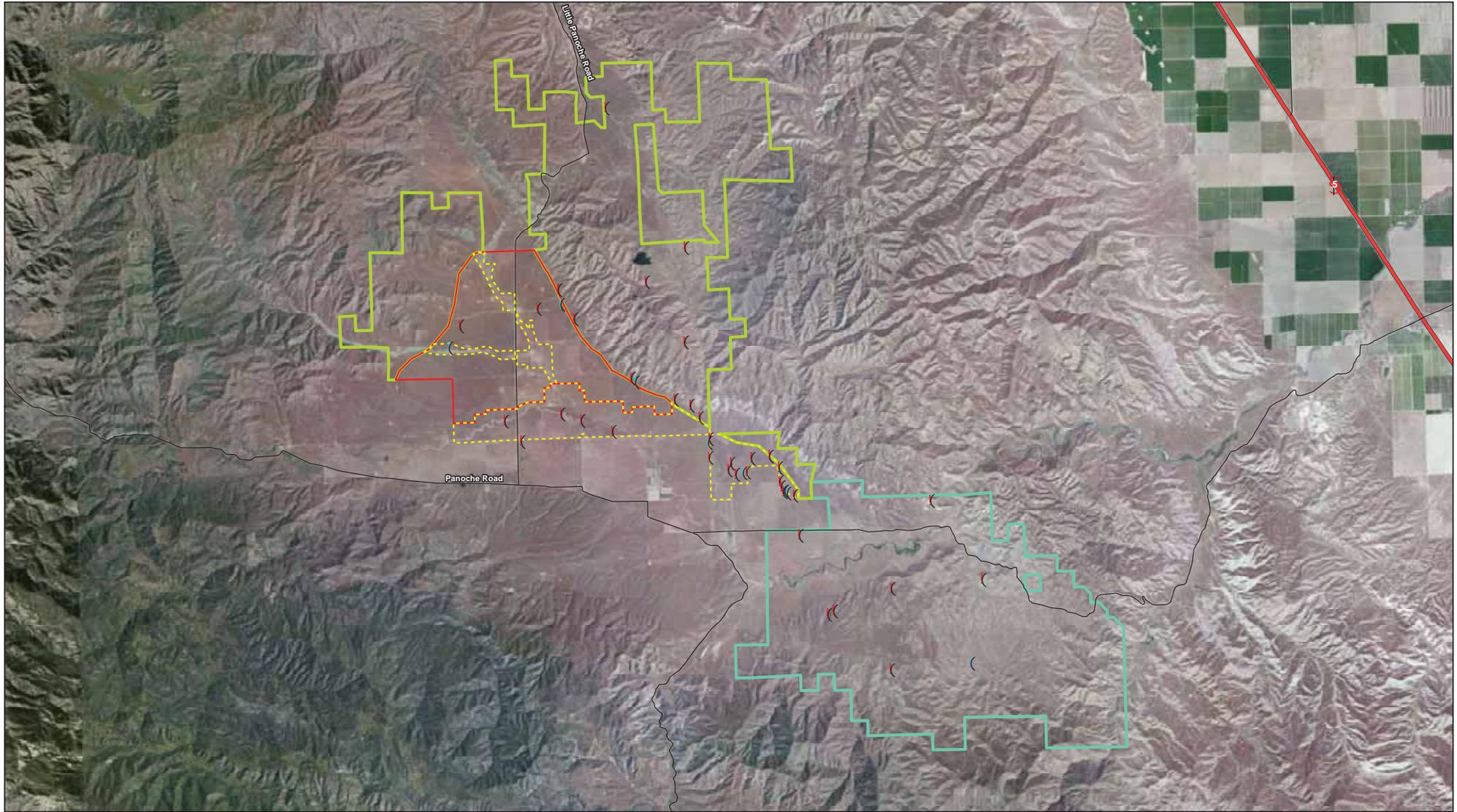
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- Approximate Valadeao Ranch Boundary
- Approximate Project Boundary
- Valley Floor Conservation Lands
- No Data
- No Activity
- GKR Evidence Active
- GKR Evidence, Inactive
- Relict GKR Sign Present



Duke Energy Renewables
Panoche Valley Solar Project
GKR Survey Data and Valadeao Ranch

Figure
7

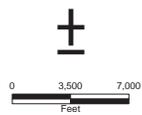


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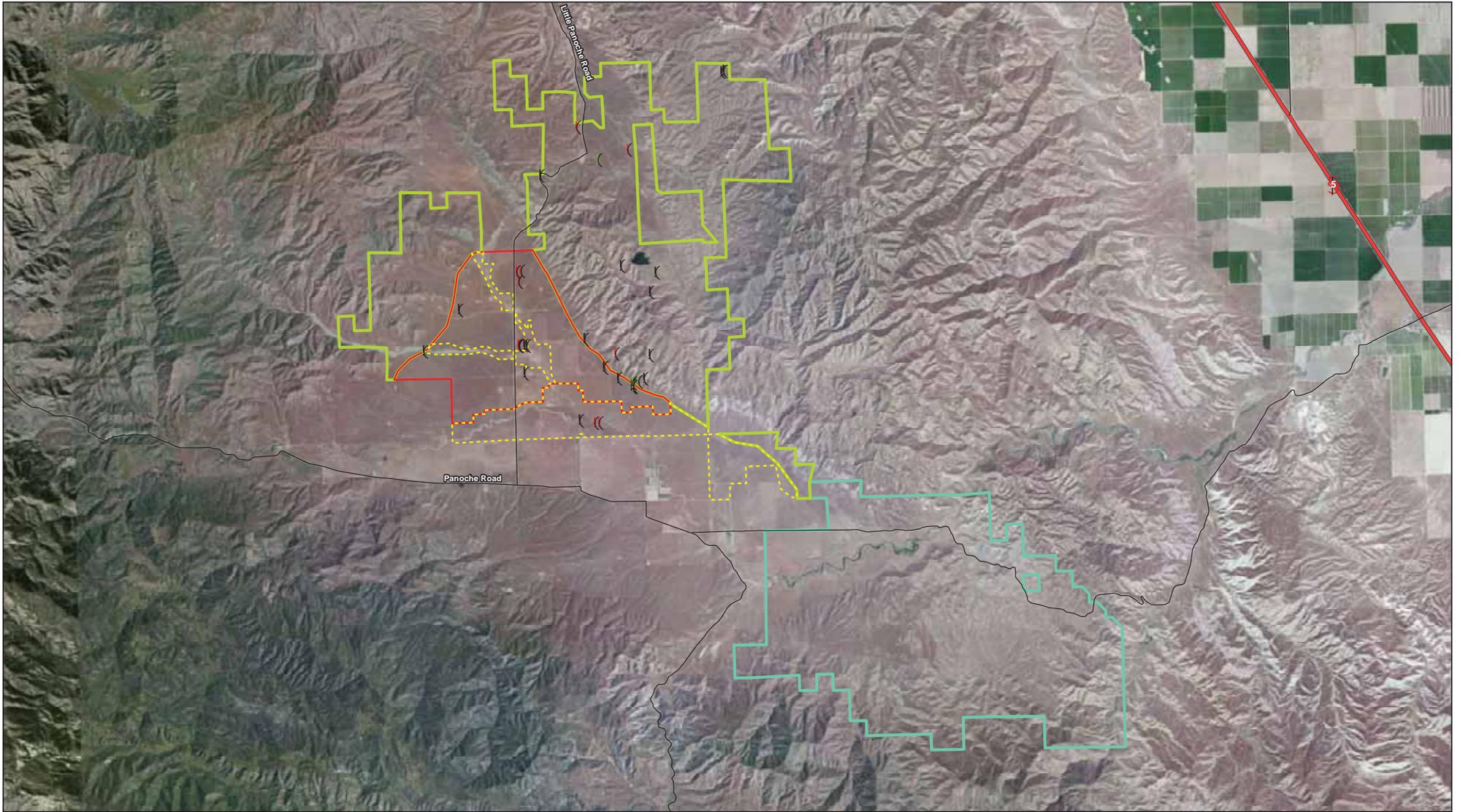
- ▭ Approximate Project Boundary
- ▬ Valley Floor Conservation Lands
- ▬ Approximate Valadeao Ranch Boundary
- ▬ Approximate Silver Creek Ranch Boundary

- Status**
- (Natal/Pupping Den
 - (Known Den



Duke Energy Renewables
Panoche Valley Solar Project
San Joaquin Kit Fox Observations

Figure
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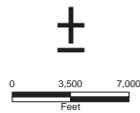


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- ▭ Approximate Project Boundary
- ▬ Valley Floor Conservation Lands
- ▬ Approximate Valdeazo Ranch Boundary
- ▬ Approximate Silver Creek Ranch Boundary

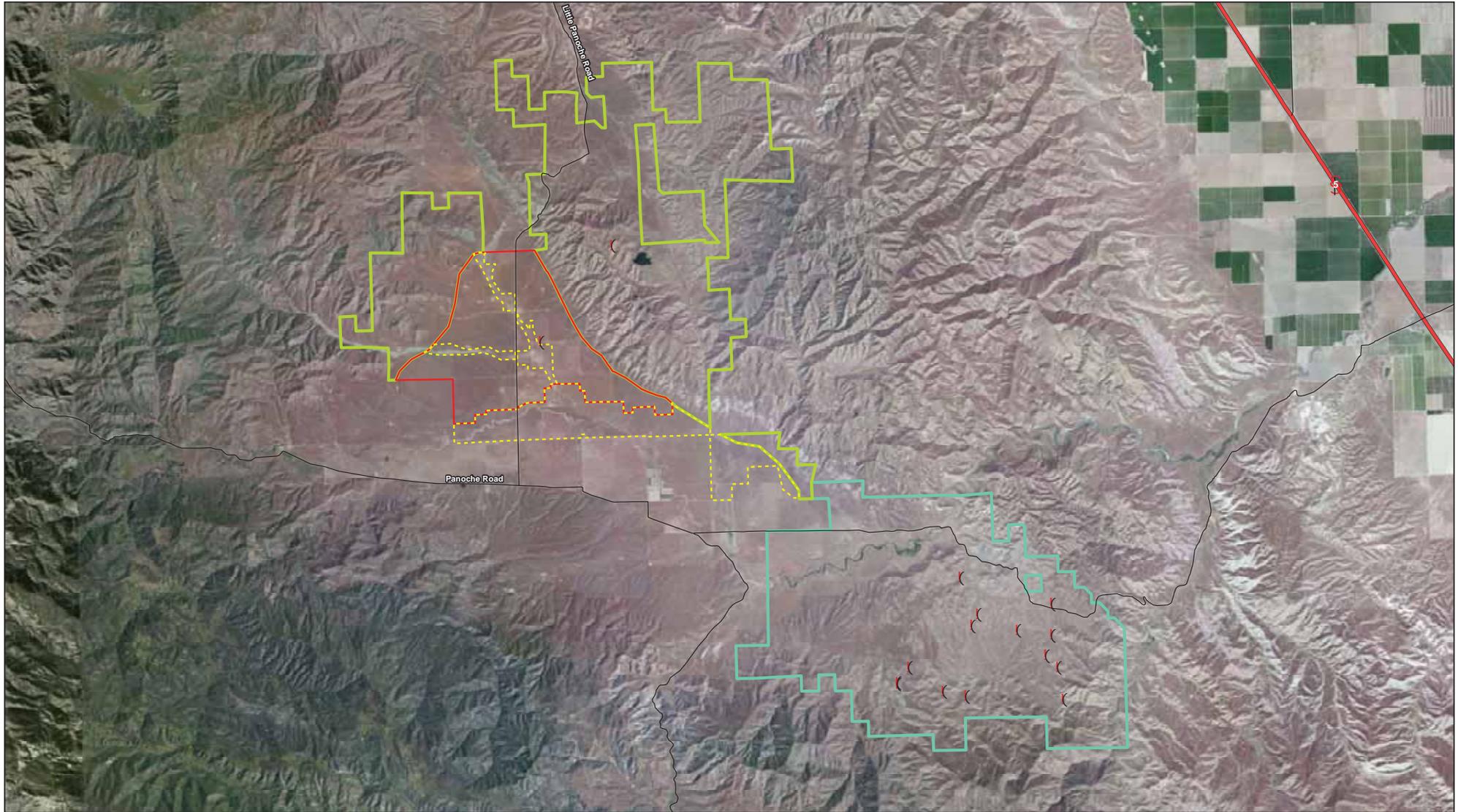
- Burrow Status**
- C Suspected Active
 - C Suspected Inactive
 - C Status Unknown



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Burrowing Owl Observations

Figure
9



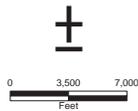
BR
8/1/2013

Legend

- ▭ Approximate Project Boundary
- ▬ Valley Floor Conservation Lands
- ▬ Approximate Valdeazao Ranch Boundary
- ▬ Approximate Silver Creek Ranch Boundary

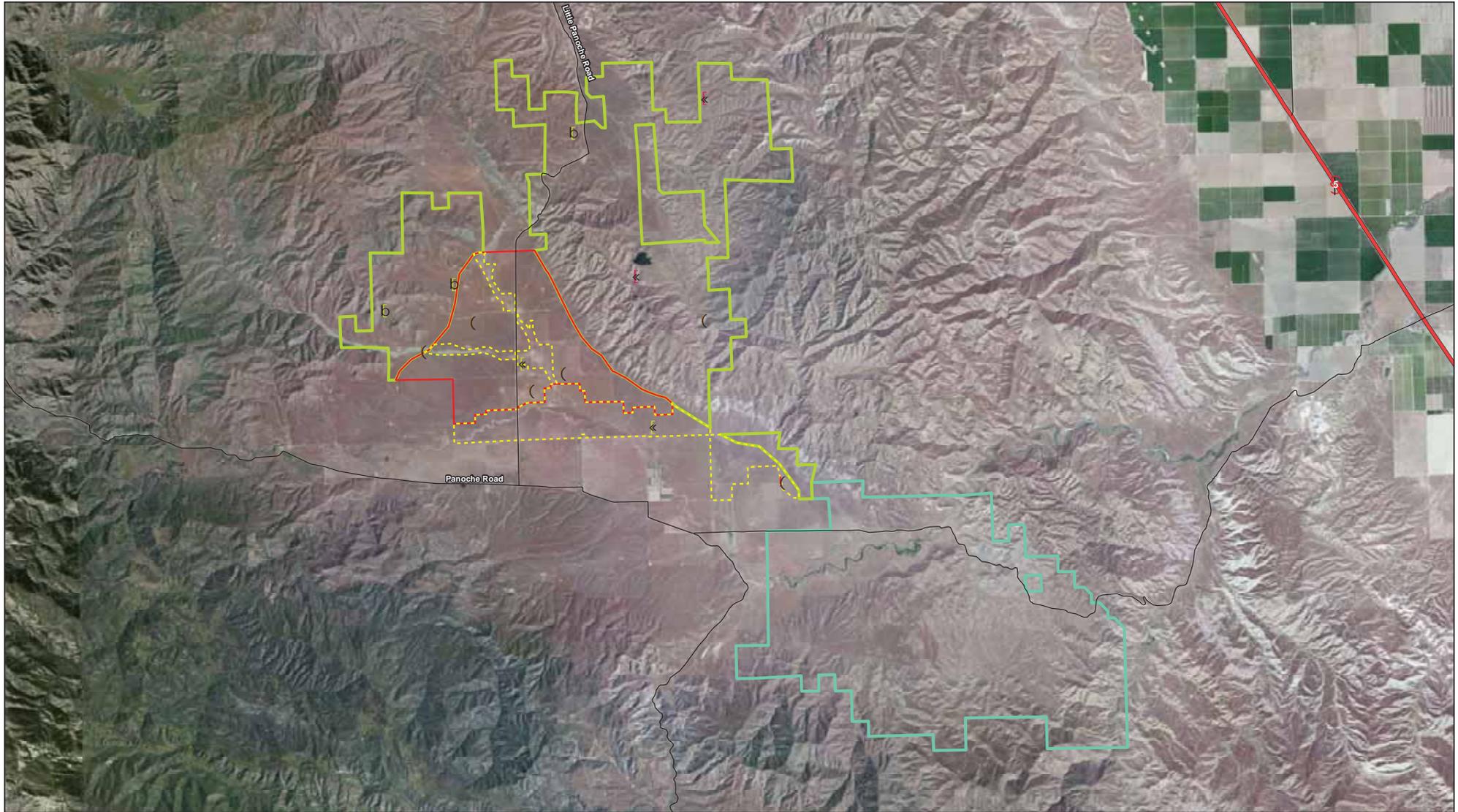
Status

- ⤿ Observation Location



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San Joaquin Antelope Squirrel Observations

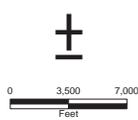
Figure
10



BR
8/1/2013

Legend

- Approximate Project Boundary
- Valley Floor Conservation Lands
- Approximate Valdeazao Ranch Boundary
- Approximate Silver Creek Ranch Boundary
- ↖ Mountain Plover
- b Golden Eagle
- C Stick Nest
- L Coast Horned Lizard
- B Badger Burrow



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Other Incidental Observations

Figure
11

